Progress Toward Standards

Grade 8

Mathematics

Framework

1/13/03

Strand 1: Numbers and Operations

Standard 1.1: Students demonstrate understanding of number concepts.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- translating among forms for expressing large and small numbers, including scientific notation
- using positive and negative rational numbers to represent real life situations
- interpreting integral exponents and roots
- recognizing the applications of proportions and percents to real-life situations
- recognizing and generating equivalent fractions, decimals, and percents
- ordering rational numbers and square roots
- reasoning with regard to multiples, factors, primes, and divisibility

Standard 1.2: Students demonstrate an understanding of the concepts of operations.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- recognizing the effects of addition, subtraction, multiplication, and division with rational numbers and roots
- applying the commutative, associative, identity, inverse, and distributive properties

Standard 1.3: Students demonstrate fluency in computing and estimating.

In the grade 8 test, fluency is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- adding, subtracting, multiplying, and dividing with rational numbers, including negative rational numbers
- applying correct order of operations and laws of exponents
- computing with ratios, proportions, and percents
- estimating based on operations described above

Strand 2: Algebra

Standard 2.1: Students demonstrate understanding of patterns, relations, and functions.

In the grade 8 test, facility is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- representing rules for real life and mathematical patterns using words, algebraic expressions, or equations
- drawing conclusions and making predictions based on patterns and relationships, both mathematical and from real life
- recognizing relationships represented by tables or graphs as linear or non-linear

Standard 2.2: Students demonstrate the ability to use algebraic symbols to represent and analyze situations.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- representing linear and simple quadratic real life situations with algebraic expressions, equations, or inequalities
- solving linear equations in one variable
- evaluating expressions for given values
- recognizing and writing equivalent expressions
- graphing linear equations and inequalities
- writing equations to represent linear graphs
- determining the slope and intercepts of a linear equation represented by a graph or an equation and interpreting the meaning of those values relative to the context of the problem

Standard 2.3: Students demonstrate the ability to create models to represent mathematical relationships.

In the grade 8 test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- recognizing and creating multiple representations (e.g., words, charts, algebraic expression or equations, and graphic representations) of the same linear real life situations

Standard 2.4: Students demonstrate an understanding of change in a variety of situations.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- matching a situation involving a variable rate of change to a graphic representation that best represents that situation
- determining in a mathematical or real life situation involving a constant or variable rate of change how a change in one variable affects the other variable

Strand 3: Geometry

Standard 3.1: Students demonstrate understanding of two- and three-dimensional geometric shapes and the relationships among them.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- reasoning about geometric figures and the relationships among them based on their definitions and properties
- providing reasons that geometric statements are true and evaluating given reasons
- providing counterexamples to show that certain geometric statements are false
- determining similarity of geometric figures

Standard 3.2: Students demonstrate understanding of coordinate systems.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- making connections between properties of geometric figures and coordinate geometry, e.g., finding lengths of sides of polygons or coordinates of the midpoints of the sides

Standard 3.3: Students demonstrate understanding of symmetry and transformations.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- describing the transformation(s) (translation, reflection, and/or rotation) that transform a figure into its image
- determining the image of a figure on the coordinate plane after a translation, reflection, or rotation
- recognizing the connections between transformations and congruence, line symmetry, and rotational symmetry

Standard 3.4: Students demonstrate an ability to perform visual and spatial reasoning.

In the grade 8 test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- constructing a net (pattern) for a common 3-dimensional figure
- identifying views (e.g., front, top, right side) of a 3-dimensional structure
- solving problems involving simple networks

Strand 4: Measurement

Standard 4.1: Students demonstrate understanding of concepts and processes of measurement.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- selecting the best measurement strategy to use relative to the purpose of the measurement and its required accuracy
- identifying the possible error in a reported measurement
- using formulas to determine how a change in side length (radius) or height affects the perimeter (circumference) and area in triangles, parallelograms, and circles, and the volume in rectangular or triangular prisms.
- performing conversions among measurements of area and volume, e.g., 1 square centimeter is equal to 100 square millimeters
- performing conversions among customary units and among metric units for linear measurements and measurements of capacity and weight
- estimating equivalent measures between the customary and the metric systems based on benchmark equivalents

Standard 4.2: Students demonstrate facility with the tools, procedures, and formulas of measurement.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- solving problems involving rates and derived measurements, e.g., miles per gallon
- estimating perimeters, areas, and volumes of irregular regions
- using given formulas to find the circumferences of circles and areas of rectangles, triangles, parallelograms, trapezoids, and circles as well as areas of figures that can be subdivided into these shapes
- using given formulas to find the volumes of prisms, cylinders, cones, and pyramids
- finding surface areas of prisms and cylinders
- solving problems using a scale factor
- solving problems involving proportionality and geometric similarity
- solving problems involving the Pythagorean theorem

Strand 5: Data Analysis and Probability

Standard 5.1: Students demonstrate facility in collecting, organizing, and displaying data.

In the grade 8 test, facility is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- determining appropriate data to collect for a given purpose and how to go about collecting and analyzing that data
- selecting appropriate graphic representations for data sets
- interpreting and constructing bar graphs, pictographs, line graphs, line plots, stem-and-leaf graphs, circle graphs, frequency charts, histograms, box-and-whisker graphs, and scatter plots
- recognizing how different representations of the same data sets can have affect their interpretation

Standard 5.2: Students demonstrate an understanding of statistical methods.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- calculating the mean, median, mean, and range of a data set and interpreting their meanings relative to the data set
- making judgments regarding the shape and spread of data sets, including consideration of outliers and quartiles
- determining how a change in a one or more data points affects the mean and median of a data set

Standard 5.3: Students demonstrate the ability to draw conclusions and make inferences based on data.

In the grade 8 test, ability is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- drawing conclusions and making inferences and predictions based on data given in charts and graphs
- drawing lines of best fit on scatter plots and using them to make predictions

Standard 5.4: Students demonstrate an understanding of probability.

In the grade 8 test, understanding is demonstrated with the following indicators as well as by solving problems, reasoning, communicating, representing, and making connections based on the indicators—

- determining all possible outcomes for an experiment, using a tree diagram, an organized list, or, when appropriate, the fundamental counting principle
- finding the theoretical probability of a event in an experiment with equally likely outcomes
- finding theoretical probability involving independent and dependent events
- finding the empirical probability of an event, given a set of data
- making predictions based on probability